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Title of the Invention: A Sealed Container

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SPECIFICATION

Title of the Invention

A sealed container

Scope of Patent Claims

① A sealed container characterised in that, in a sealed container made of rigid material that is filled with contents and heat sterilised, the opening part is sealed by an inner cap made of flexible material and an outer cap made of rigid material and an airtight space is formed between the inner cap and the outer cap.

Detailed Explanation of the Invention

Field of Industrial Application

This invention relates to a sealed container.

Prior Art and Problems

At present, sealed containers made of rigid material such as glass containers (hereinafter expressed as 'glass containers') have conventionally been sealed by a screw cap or twist cap or the like and hot water sterilisation at 90°C or above or retort sterilisation at a temperature of 110~120°C has been applied. In general, the occurrence of looseness is comparatively rare with the screw cap, but it is somewhat difficult to open. On the other hand, it is comparatively easy to open the twist cap, but this is prone to looseness. However, problems that are common to both are as follows: (a) Because the seal is effected by mechanical force through fastening the metal cap tightly, looseness of the cap may occur in the sterilisation process under the effect of heat. (b) The cap is liable to be deformed by the corner part of the cap striking something during conveyance and a gap is liable to occur between the glass container and the cap. (c) As a result of (a) and (b) above, the sealed state of the glass container is frequently impaired, mould occurs and the contents either degenerate or go bad. Such problems can be partially alleviated by increasing the fastening torque of the cap metal fitting, but in this case it is unavoidable that opening the seal becomes extremely difficult.

Recently, a method has been developed whereby cap material formed of heat plastic resin has been heat press bonded on to one side of aluminium foil or an aluminium foil laminate in the opening part of the glass container and thus the seal has been effected. In sealed containers obtained by this method, although problems such as degeneration or leakage of the contents through damage to the cap arising through contact or impact during conveyance or difficulty in opening the seal are overcome, fresh obstacles occur in the heat sterilisation process. That is to say, if retort sterilisation is carried out for 30 minutes at 120°C, for example, then, because the heat capacity of a glass container is large, large differences occur between the temperature of the interior of the retort furnace and the temperature of the contents in the interior of the glass container. This temperature difference causes a pressure difference between the internal pressure and the external pressure of the glass container. In the case of a sealed body consisting of flexible material, rupture does not occur because it changes shape freely and the difference in pressure is absorbed; but, in the case of a sealed container made of rigid material such as a glass container, the cap material ruptures and the heat press bonded part peels off because all the force falls upon the cap material and its heat press bonded part. Such problems can theoretically be overcome by regulating the pressure in the interior of the retort furnace. However, as the said pressure difference varies according to such things as the size of the glass container and the amount and type of the contents, it is difficult to carry out processing with two or more sorts of sealed containers with different contents or capacities while simultaneously controlling the pressure so that rupture or peeling does not occur. Ultimately it becomes necessary to have a complicated operation whereby retort sterilisation is carried out on containers of the same volume and contents.

Means of Overcoming the Problems

As a result of much diligent research in the light of problems with conventional technology like those described above, the inventors of this invention discovered that the problem could be virtually overcome if the cap was made to have a duplex structure with an airtight space in between.

That is to say, this invention is one that can provide the following sealed container.

① A sealed container characterised in that, in a sealed container made of a rigid material that is filled with contents and heat sterilised, the opening part is sealed by an inner cap made of flexible material and an outer cap made of rigid material and an airtight space is formed between the inner cap and the outer cap.

An explanation of this invention is given below in concrete terms, making reference to the diagrams.

In Fig. 1, container (1) made of rigid material such as a glass container or ceramic container is in a state where it is filled with contents (6) and its opening part is closed by inner cap (2) and outer cap (3). Airtight space (4) is formed between these. Inner cap (2) consists of a flexible material such as metal foil like aluminium foil, plastic film or a composite material of plastic film and aluminium foil and it is heat sealed on the end of the opening part of container (1). Outer cap (3) consists of a rigid material such as metal, plastic or glass and it is fitted as a screw cap or twist cap. In order to maintain a high state of sealing of airtight space (4) that is provided between inner cap (2) and outer cap (3), it is desirable to place packing (5), consisting of heat resistant silicone rubber or the like, between the two caps. This packing (5) is also useful for preventing peeling of the heat seal part of inner cap (2).

If a sealed container that is in the state shown in Fig. 1 is subjected to heat sterilisation at 90°C or above or retort sterilisation at 110~120°C, the internal pressure of the said air layer and the internal pressure of the glass container are balanced relatively easily through the expansion and contraction of the air layer present inside airtight space (4) and therefore no particularly great force is applied to inner cap (2) and its heat seal part and consequently the seal is not broken.

Fig. 2 shows inner cap (2) in which central part (7) projects downwards. In this case, airtight space (4) can be made bigger than that in the sealed container shown in Fig. 1 and therefore it can withstand larger variations in pressure.

Effect of the Invention

The following effects are achieved by this invention.

(i) Rupture of the seal through damage to the cap material does not occur even with whirling sterilisation or hot water sterilisation in which counter-pressure is not applied.

(ii) The seal is not ruptured during retort sterilisation, where counter-pressure is applied, and the process can be carried out even if control of the internal and external pressure of the glass container is not done very accurately.

Practical Embodiments

The characteristics of this invention are further clarified by showing the following practical embodiments

Practical Embodiment 1

After the glass container, coated 1μm thick with denatured polyolefin at the top end of the opening part, had been filled with mushrooms boiled in soy sauce at 60°C, heat sealing of the glass container was carried out under conditions of 200°C x 4kg/cm^2 for 2 seconds using cap material consisting of a printed layer/50μm aluminium foil/adhesive layer/40μm denatured polyolefin layer. Then a sealed container provided with an airtight space like that shown in Fig. 1 was obtained by fitting a tin-plated screw fitted outer cap with packing made of heat resistant silicone interposed.

After the sealed container obtained had been retort sterilised (counter-pressure 0.8kg/cm^2) for 21 minutes at 116°C, it was cooled in 3 stages under conditions of being kept for 12 minutes at 90°C, 12 minutes at 70°C and 12 minutes at 40°C.

There were no defects in the seal in 300 items on which this sterilisation and cooling were carried out.

Practical Embodiment 2

After a glass container like the one used in Practical Embodiment 1 had been filled with boiled *kombu* seaweed, it was sealed by an inner cap and outer cap in the same way as in Practical Embodiment 1. Next it was heated for 60 minutes by steam at 100°C and then left to cool.

No defects at all were found in any of the 200 items that were sterilised and left to cool.

Brief Explanation of the Diagrams

Fig. 1 is a longitudinal cross section showing one practical model of this invention.
Fig. 2 is a longitudinal cross section showing an example of a variation of the inner cap.

(1) container of rigid material
(2) inner cap
(3) outer cap
(4) airtight space
(5) packing
(6) contents
(7) projecting central bottom part of inner cap (2)

(Ends)

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